(19) JAPANESE PATENT OFFICE

PATENT ABSTRACTS OF JAPAN

(11) Publication number: **07153577 A**

(43) Date of publication of application: **16.06.95**

(51) Int. Cl **H05B 37/00**
F21L 11/00
G09F 13/20
H01H 36/00
H02J 7/00
// F21M 1/00

(21) Application number: **05321163**

(22) Date of filing: **26.11.93**

(71) Applicant: **TOKIN CORP**

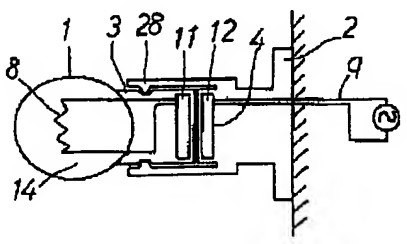
(72) Inventor: **OTSUKI ETSUO**
KONO NORIO

(54) LIGHTING SYSTEM

(57) Abstract:

PURPOSE: To eliminate exposure of a power supply terminal, and prevent corrosion of the terminal by arranging a power receiving coil and a power supply coil opposite to each other in a noncontact condition, and connecting them electrically to each other by mutual induction.

CONSTITUTION: A power supply part 4 on the electric power supply side is enclosed in a fixing jig 2, and is fixed to a wall or the ceiling, and a ring-shaped power supply coil 12 is connected to the tip of the power supply part 4, and is housed in an insulating condition inside the jig 2. A light emitter 1 is composed of a light emitting part 14 and a power receiving part 3, and the light emitting part 14 is an electric lamp, and a power receiving coil 11 is connected to the tip of a lead pulled out of the electric lamp. Since the coil 11 is sealed in an airtight condition by protecting the outer periphery from the tip of the power receiving part 3 by an insulating material, the coils 11 and 12 are put in a noncontact condition. The coils 11 and 12 are arranged so as to be opposed to each other by a locking piece 28 extending from the power supply part 4 by approaching the power receiving part 3 of the light emitter 1 to the power supply part 4. Thereby, electric connection of the coils 11 and 12 can be efficiently performed at prescribed distance by mutual inductance.



(19)日本国特許庁（ＪＰ）　(12) **公開特許公報（Ａ）**　(11)特許出願公開番号

特開平7－153577

(43)公開日　平成７年(1995)６月16日

(51)Int.Cl.[6]	識別記号	庁内整理番号	ＦＩ	技術表示箇所
Ｈ０５Ｂ　37/00		6929－3K		
Ｆ２１Ｌ　11/00	Ｄ			
Ｇ０９Ｆ　13/20	Ａ	8621－5G		
Ｈ０１Ｈ　36/00	Ｖ	7610－5G		
Ｈ０２Ｊ　7/00	Ａ			

審査請求　未請求　請求項の数４　ＦＤ　（全　５　頁）　最終頁に続く

(21)出願番号　特願平5－321163

(22)出願日　平成５年(1993)11月26日

(71)出願人　000134257
株式会社トーキン
宮城県仙台市太白区郡山６丁目７番１号

(72)発明者　大槻　悦夫
宮城県仙台市太白区郡山６丁目７番１号
株式会社トーキン内

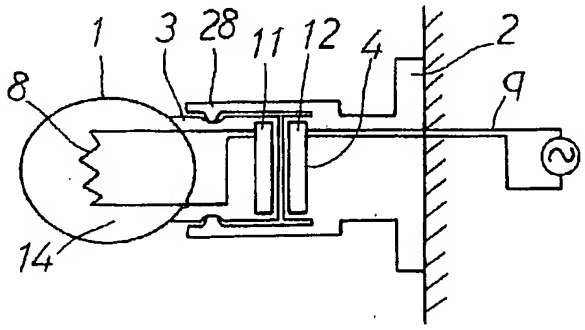
(72)発明者　幸野　憲雄
宮城県仙台市太白区郡山６丁目７番１号
株式会社トーキン内

(54)【発明の名称】　照明装置

(57)【要約】

【目的】　発光器の付け外しが簡単かつ安全にでき、発光部への給電用端子が露出しない構造で、端子の腐蝕等の心配がない照明装置を供する。

【構成】　電気を用いて発光する発光部１４とこの発光部に電力を供給する受電部３を持つ発光器１と、この発光器１に電力を供給する電源側の給電部４から成る照明装置の受電部３の先端の電気的接続部と給電部４の先端の電気的接続部に一対の相互誘導コイルが別々に接続収納され、発光器１の受電部３側の相互誘導コイル（受電コイル１１）と給電部４側の相互誘導コイル（給電コイル１２）が非接触状態で所定の位置に向かい合って配置され、相互誘導により電気的に結合し、給電部４から発光器１の受電部３に電力を供給する構造の照明装置と、前記照明装置の発光部に蓄電制御部が設けられ、２つにコイルの周囲に磁性体が配置された照明装置、及び前記照明装置を常備用携帯型非常灯及び消火器の表示灯に用いた照明装置。



1

【特許請求の範囲】

【請求項１】　発光部とこの発光部に電力を供給する受電部を持つ発光器と、この発光器に電力を供給する電源側の給電部から成る照明装置において、発光器の受電部の先端の電気的接続部と給電部の先端の電気的接続部に一対の相互誘導コイルが別々に接続収納され、発光器の受電部側の相互誘導コイル（受電コイル）と給電部側の相互誘導コイル（給電コイル）が非接触状態で所定の位置に向かい合って配置されたとき、相互誘導により電気的に結合して、給電部から発光器の受電部に電力を供給する構造を特徴とする照明装置。

【請求項２】　請求項１記載の照明装置において、発光器が、発光部と、受電部と、蓄電池とその電流を制御する制御回路から成る蓄電制御部からなり、発光器と給電部にそれぞれの対となる給電コイルと受電コイルの存在を検知するセンサが収納され、かつ、受電コイルと給電コイルの内側や周囲に近接して磁性体が配置された構造を特徴とする照明装置。

【請求項３】　請求項２記載の照明装置において、発光器として発光表示装置と採照照明装置を有する常備用携帯型非常灯としたことを特徴とする照明装置。

【請求項４】　請求項２記載の照明装置において、発光器として消火器に併設した発光表示装置及び採照照明装置であることを特徴とする照明装置。

【発明の詳細な説明】

【０００１】

【産業上の利用分野】本発明は、照明装置に関係し、発光器の受電部と発光部とが一体に形成され、電源側の給電部と非接触状態で電力が発光部に移送でき、特に、発光器の受電用電気接続部を非露出構造とすることができる照明装置に関係する。

【０００２】

【従来の技術】従来の照明用や表示用灯具は、図６に示すように、発光部分の発光器１と電源側の給電部４との接続が、互いにその先端に設けた接続用電極を機械的に接触させて、さらに、スイッチを介して、電気的に接続し、発光器１に電力を供給していた。浴室のように湿度の高い場所、工場などで腐蝕性のガスや粉塵が多い場所で使用される照明器具は、接点部分から漏電しやすく、接点部の腐蝕による接触不良により点灯出来なかったり異常加熱するという問題がある。白熱灯や蛍光灯などの照明器具の発光部分はガラス管に封入して用いられるが、封着部分の外に金属が露出するため、腐蝕などにより、破損していた。また、受電端子５や給電端子６が露出しているので、付け外し時に触れると感電事故を起こす危険がある。引火性のガスの濃度が高い場所では、接点が露出していると開閉時の火花により火災を引き起こす危険がある。特に非常用照明などでは、長期に亘り使用しないと接触不良などにより、すぐ使用できない等の問題がある。

2

【０００３】

【発明が解決しようとする課題】本発明は、上述の問題点を解消した、照明装置の発光器を簡単にしかも安全に付け外しが可能で、発光部への給電用端子が露出しない構造で、端子の腐蝕等の心配がない照明装置を供することにある。

【０００４】

【課題を解決するための手段】本発明は、上述の課題を解決するために、照明装置の発光器と電源側との接続に、接触端子を用いることなく、相互誘導コイルの各々を発光器の受電部と、電源側の給電部に別々に内蔵させ、使用時に相互誘導が起こるよう、接近して配置させた構造の照明装置を供する。更に、上記照明装置において、受電コイルと給電コイルの周囲に磁性体を配置し、コイル間の電力の移送を効率よく行えるようにする。また、発光器と給電部に各々の存否を確認出来るセンサを設け、給電側では発光器の移動により電源側のコイルを開状態にしたり、発光器の不在を警報するため信号を発し、発光器側では電源と離れたことにより照明の状態を例えば表示から採照に変えたり、蓄電部への蓄電状態から発光部への給電に変えるなど制御のための信号を出せる構造とする。さらに、発光器の光源部と受電コイルの間に制御回路と蓄電池からなる蓄電制御部を設け、蓄電制御部は、発光部が給電側の給電コイルと離れて相互誘導が働かなくなっても発光器は照明し続けることができるように充放電を制御し、コードレスの照明装置として効率よく使える構造の照明装置を供する。

【０００８】即ち、本発明は、①発光部とこの発光部に電力を供給する受電部を持つ発光器と、この発光器に電力を供給する電源側の給電部から成る照明装置において、発光器の受電部の先端の電気的接続部と給電部の先端の電気的接続部に一対の相互誘導コイルが別々に接続収納され、発光器の受電部側の相互誘導コイル（受電コイル）と給電部側の相互誘導コイル（給電コイル）が非接触状態で所定の位置に向かい合って配置されたとき、相互誘導により電気的に結合して、給電部から発光器の受電部に電力を供給する構造を特徴とする照明装置である。②上記①記載の照明装置において、発光器が、発光部と、受電部と、蓄電池とその電流を制御する制御回路から成る蓄電制御部からなり、発光器と給電部にそれぞれの対となる給電コイルと受電コイルの存在を検知するセンサが収納され、かつ、受電コイルと給電コイルの内側や周囲に近接して磁性体が配置された構造を特徴とする照明装置である。③上記②記載の照明装置において、発光器として発光表示装置と採照照明装置を有する常備用携帯型非常灯としたことを特徴とする照明装置である。④上記②記載の照明装置において、発光器として消火器に併設した発光表示装置及び採照照明装置であることを特徴とする照明装置である。

【０００９】

3

【作用】図２に示すように、発光器と電源側の給電部４は別々に形成され、使用時に、所定の位置に配置することで、受電コイル１１と給電コイル１２が相互誘導状態になり、給電部４と受電部３の間で給電が行われるようになっている。発光器１と電源側との接続を、従来の機械的接触による接続から、相互誘導コイルを２つのコイルに分け、各々を発光部と電源側に配置した構造なので、これを所定の距離に近接して配置したとき、電源側のコイルと発光器側のコイルの間で相互誘導が起こり、電力が供給できる。従って、機械的接点を持つことなく取り付け取り外しが可能となり、コイル間の距離を離すことでオンオフでき、開閉などによる火花の心配や接点の腐蝕の心配もない照明装置が提供できる。また、受電コイル１１と給電コイル１２の周囲に磁性体１３を配置することで照明装置への電力移送効率を改善でき、小型化も可能となる。また、センサと蓄電部と制御回路部を発光器に設けることで、蓄電放電の使い分けを行うことができ、接続コードを用いずに、非常事態の発生の検知等用途を広げた効率的な使い方ができる。

【００１０】

【実施例】本発明の実施例について、以下、図面を参照して説明する。図１は、本発明の一実施例の照明装置を示す模式断面図、図２は、本発明の照明装置の給電の原理を説明する図、図３は、本発明の他の実施例の照明装置を示す模式断面図、図４は、本発明の照明装置を常備用携帯型非常灯に応用した実施例を示す模式断面図、図５は、本発明の照明装置を消火器の表示探照照明装置に応用した実施例を示す模式断面図である。

【００１１】実施例１。図１に示すように、この照明装置は、発光部１４と受電部３からなる発光器１と、電源側の給電部４からなる。電源側の給電部４は、固定治具２に内蔵されて壁や天井に固定される。給電部４の先端には、リング状の給電コイル１２が接続され、固定治具２の内側に絶縁状態で収納されている。発光器１は、発光部１４と受電部３からなり一体に成形されている。発光部１４はフィラメントタイプの電球で、電球から引き出されたリードの先端には受電コイル１１が接続されている。受電コイル１１は受電部３の先端に外周を絶縁材料で保護され、気密状態で封着されている。受電コイル１１と給電コイル１２は、給電部４に発光器１の受電部３を接近させ、給電部４から伸びた係止片２８で固定したとき、所定の距離で、相互誘導が効率よく行われる配置となっている。本実施例の照明装置では、発光部１４として低圧用白熱電球を用い、給電コイル１２と受電コイル１１は外径３０ｍｍ、内径１５ｍｍの大きさで、コイルが互いに同軸状に近接したとき、約１ｍｍに近接できるように各コイルの外側は約０．４ｍｍ厚の絶縁樹脂で全面が被覆したものを用いている。電源として、１００キロヘルツ、５ボルトの交流を給電コイル１２に加えたところ、白熱灯を点灯させることが出来た。接点が露出していないので感電事故や接触不良による事故の心配なく使用できた。

4

【００１２】実施例２。第２の実施例は、図３に示すように、実施例１の照明装置において、発光器１側の発光部１４と受電コイル１１との間に、蓄電池と、制御回路を有する蓄電制御部１７を設けている。受電コイル１１と給電コイル１２には、コイルが近接した状態にあるときのコイルの外側に接して、磁性体１３が配置された構造である。実施例１と同じ構成の受電コイル１１と給電コイル１２を用い、磁性体１３として１００キロヘルツでの透磁率が約１００００のフェライトの円板を用いた。蓄電制御部１７の蓄電部にはアルカリ電池を用い、制御回路部には、整流、充放電制御回路他の回路が収容されている。蓄電制御部１７では、受電コイル１１からの電圧と電池からの電圧を検出比較し、電池からの電圧が所定値より低く、受電コイル１１からの電圧が所定値以上のときは、充電を行い、同時に、発光部１４の電球にも給電する。発光器１が所定の位置から移動した場合は受電コイル１１からの電圧は零となり、制御回路部により受電コイル１１を解放し、発光部１４に放電するように制御する。給電コイル１２に１００キロヘルツで５ボルト交流を印加したところ、点灯できた。本実施例の照明装置により電源側から発光器に点灯用として移送した電力は、約６０％移送効率であった。発光器１を固定治具２の係止片２８から外して持ち歩いても固定時と同様に点灯することが出来た。

【００１３】実施例３。第３の実施例は、図４及び図５に示すように、常備用携帯型非常灯（図４）と消火器の発光表示装置２２、探照照明装置２４（図５）の例である。基本構成は実施例１と同様で、受電コイル１１と給電コイル１２は同じ大きさのものを使用した。各々のコイルは、近接したときの各々のコイルの外側に接した位置に、磁性体１３の円板が取り付けられている。本例では磁性体１３として、透磁率が１００００のフェライト円板が用いられている。発光器（非常灯２１、消火器２６）、及び台１８に設けた電源側の給電部には、それぞれ組み合わせられる給電部及び発光器が所定の近接位置に在るか否かを検地するセンサ１５、１６が取り付けられ、各々の蓄電制御部１７に接続している。通常はセンサ１５、１６により照明装置の発光器部が所定の位置に在ることを確認し、電源側の給電コイル１２に通電し、充電部への充電放電を制御し、同時に発光表示装置２２を点灯する。発光器（常備用携帯型非常灯２１や消火器２６）を所定の位置から持ち出した場合、発光器側では蓄電部からの電力により探照照明装置２４が点灯され、電源側では給電コイル１２への電流を遮断し、発光器（非常灯２１、消火器２６）が移動したことが全体を管理している部署等へ連絡できる。

【００１４】

【発明の効果】以上説明したように、本発明によれば、

5　　6

電気的接触部を露出させる必要がない構造なので、感電事故やノイズの心配もなく、また、湿気や腐蝕性のガス等による接点の劣化の心配もなく、長期間経過後や、可燃ガスの充満している危険な場所でも安心して、接続コードなしに使用できる照明装置が供給できる。

【図面の簡単な説明】

【図１】本発明の一実施例の照明装置を示す模式断面図。

【図２】本発明の照明装置の給電の原理を説明する説明図。

【図３】本発明の他の実施例の照明装置を示す模式断面図。

【図４】本発明の照明装置を常備用携帯型非常灯に応用した実施例を示す模式断面図。

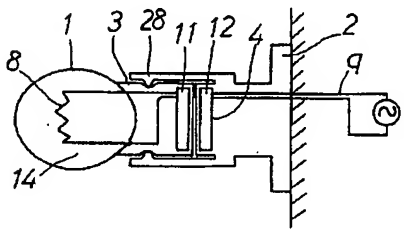
【図５】本発明の照明装置を消火器の発光表示装置と探照照明装置に応用した実施例を示す模式断面図。

【図６】従来の照明装置の発光器と電源側の給電部との接続を説明する模式断面図。

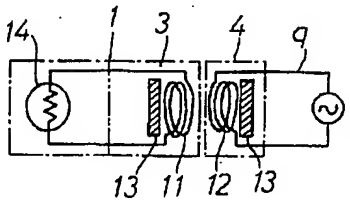
【符号の説明】

1　発光器
2　固定治具
3　受電部
4　給電部
5　受電端子
6　給電端子
7　ガラス管
8　フィラメント
9　電源ライン
１０　封着部
１１　受電コイル
１２　給電コイル
１３　磁性体
１４　発光部
１５　センサ
１６　センサ
１７　蓄電制御部
１８　台
１９　係止ばね
２０　手元スイッチ
２１　発光表示装置
２２　発光表示装置
２３　発光表示装置用ケーブル
２４　探照照明装置
２５　探照照明装置用ケーブル
２６　消火器
２７　噴射ノズル
２８　係止片

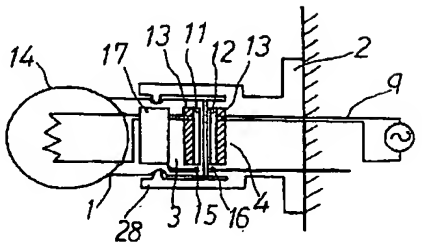
【図１】



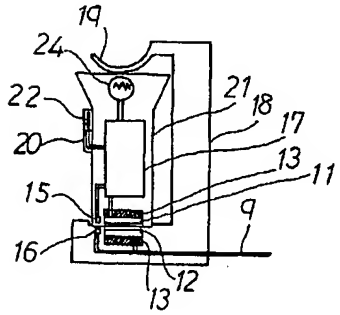
【図２】



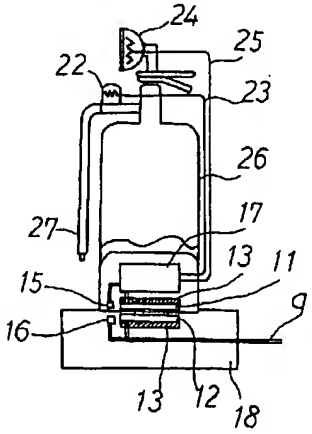
【図３】



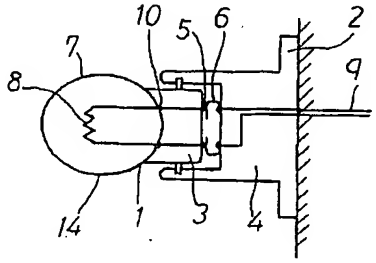
【図４】



【図５】



【図６】



フロントページの続き

(51) Int.Cl.[6]	識別記号	庁内整理番号	ＦＩ	技術表示箇所
// Ｆ２１Ｍ　1/00		Ｎ		

(19) Japan Patent Office (JP)

(11) Patent Application Laid Open No.

Hei 7-153577

[153,577/1995]

(43) Laid Open Date: 16 June 1995

(12) Kokai [Laid Open] Patent Gazette (A)

(51)	Int. Cl.[6]		Identification symbols	Internal filing codes	FI	Art description section
	H 05 B	37/00		6929 — 3K		
	F 21 L	11/00	D			
	G 09 F	13/20	A	8621 — 5G		
	H 01 H	36/00	V	7610 — 5G		
	H 02 J	7/00	A			
//	F 21 M	1/00	N			

number of claims: 4 FD [filed on floppy disk]
examination request: not yet requested
(the [Japanese] document totals 5 pages)

(21) **Application Number:**

Hei 5-321163 [321,163/1993]

(22) **Application Date:** 26 November 1993

(71) **Patent Applicant:** 000134257

Tokin Corporation
7-1, Kooriyama, 6-chome
Taihoku-ku, Sendai, Miyagi Prefecture

(72) **Inventors:** [The surname is given second — Translator]

Etsuo OTSUKI and Norio KONO
Tokin Corporation
7-1, Kooriyama, 6-chome
Taihoku-ku, Sendai, Miyagi Prefecture

(54) Title of the Invention: Lighting device

(57) Abstract

[Object]

To provide a lighting device that enables the safe and simple replacement of the light emitter, that has a structure in which the power supply terminals for the light emitting member are not exposed, and that eliminates concerns with, for example, terminal corrosion.

[Structure]

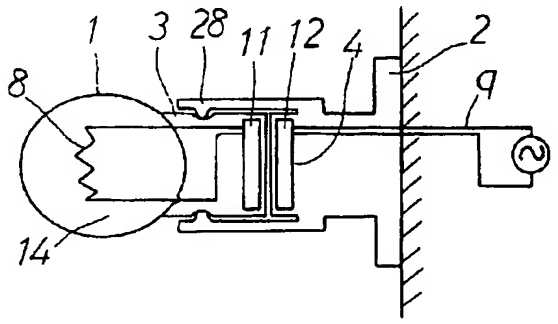
A lighting device comprising

- a light emitting member **14** that generates light using electricity,
- a light emitter **1** that has a power receiving member **3** that supplies power to the light emitting member, and
- a power supply member **4** on the power source side, that supplies power to the light emitter **1**,

with a structure that incorporates a pair of mutual induction coils, wherein one is incorporated in a connected manner in an electrical connection member at an end of the power receiving member **3** and one is incorporated in a connected manner in an electrical connection member at an end of the power supply member **4**, and

wherein the mutual induction coil (the power receiving coil **11**) on the side of the power receiving member **3** of the light emitter **1** and the mutual induction coil (the power supply coil **12**) on the side of the power supply member **4** are positioned opposite one another in a prescribed position in a noncontacting state and power is supplied from the power supply member **4** to the power receiving member **3** of the light emitter **1** by electrical connection through mutual induction.

Also, a lighting device in which a power storage control member is provided in the light emitting member of the aforementioned lighting device and in which magnets are provided on the peripheries of the two coils. Also, a lighting device comprising a lighting device as described above used as an alert light on a fire extinguisher or as a portable emergency standby light.



Claims

Claim 1.

Lighting device comprising

a light emitter that has a light emitting member and a power receiving member that supplies power to the light emitting member and

a power source-side power supply member that supplies power to the light emitter,

that characteristically has a structure in which

a pair of mutual induction coils is provided, wherein one is incorporated in a connected manner in an electrical connection member at an end of the power receiving member of the light emitter and one is incorporated in a connected manner in an electrical connection member at an end of the power supply member, and

power is supplied from the power supply member to the power receiving member of the light emitter by electrical connection through mutual induction when the mutual induction coil (the power receiving coil) on the side of the power receiving member of the light emitter and the mutual induction coil (the power supply coil) on the side of the power supply member are positioned opposite one another in a prescribed position in a noncontacting state.

Claim 2.

The lighting device of Claim 1, that characteristically has a structure in which

the light emitter comprises a light emitting member, a power receiving member, and a power storage control member comprising a storage battery and a control circuit that controls the current flow at the storage battery;

sensors that detect the presence of, respectively, the power supply coil and power receiving coil forming the pair, are incorporated in the light emitter and the power supply member; and

a magnet is disposed in the vicinity of the interior or the periphery of the power receiving coil and the power supply coil.

Claim 3.

The lighting device described in Claim 2, characterized in that the light emitter is a portable emergency standby light that has a light-emitting alerting device and a flashlight-type lighting device.

Claim 4.
The lighting device described in Claim 2, characterized in that the light emitter comprises a light-emitting alerting device and a flashlight-type lighting device both disposed in a fire extinguisher.

Detailed Description of the Invention

[0001]

Field of the Invention

The invention relates to lighting devices and relates to a lighting device in which the power receiving member and the light emitting member of the light emitter are formed into a single body, in which power can be transferred to the light emitting member without contact with the power supply member on the power source side, and in particular in which the power-receiving electrical connection member of the light emitter has an unexposed structure.

[0002]

Description of the Prior Art

In prior-art illuminating lamps and alerting lamps (see Figure 6), the light emitter **1** of the light emitting member is connected to the power source-side power supply member **4** by mechanical contact between connecting electrodes disposed at the ends of the light emitter **1** and power supply member **4** and power is fed to the light emitter **1** by electrical connection across a switch. When such lighting devices are located in high-humidity locations (e.g., bathrooms) or in locations exposed to corrosive gases or high dust loads (e.g., factories, plants), they suffer from the problems of abnormal heating and/or failure to illuminate due to defective contact caused by facile current leakage from the contact region and corrosion of the contact region. The light emitting members of illuminating devices such as incandescent lights and fluorescent lamps are used sealed within a glass tube or envelope, but the metal outside the sealed region is exposed and is therefore subject to deterioration by, for example, corrosion. Moreover, since the power receiving terminal **5** and the power supply terminal **6** are also exposed, there is a risk of inadvertent contact with these terminals during mounting or removal of the lighting device, resulting in accidental shock. Due to sparking that can occur when the lighting device is turned off or on, exposed contacts also create a fire risk when the lighting device resides at a location exposed to high concentrations of a flammable gas. In the

particular case of emergency illumination, when the device has not been used for a long period of time, immediate use may not be possible due to defective contact.

[0003]

Problems to Be Solved by the Invention

This invention provides a lighting device that solves the aforementioned problems by enabling safe and simply mounting and removal of the light emitter of the lighting device and by having a structure in which the terminals for supplying power to the light emitting member are not exposed, thus eliminating concerns with regard to terminal corrosion, etc.

[0004]

Means Solving the Problems

In order to solve the problems identified above, the invention provides a lighting device that has a structure in which, in order to connect the power source side with the light emitter of the lighting device without using contact terminals, a mutual induction coil is incorporated in the power receiving member of the light emitter and another mutual induction coil is incorporated in the power supply member on the power supply side and these are positioned in proximity to one another during use so as to produce mutual induction. In addition, a magnet may be disposed in this lighting device on the perimeter of the power receiving coil and on the perimeter of the power supply coil in order to carry out an efficient power transfer between the coils. In another structure, a sensor capable of detecting the presence of each is disposed in the light emitter and the power supply member. On the power supply side, a signal is generated in order to provide an alarm that the light emitter is absent when, for example, the coil on the power supply side is placed in an open state due to movement of the light emitter. On the light emitter side, a signal is generated upon separation from the power supply so as to provide control that converts the lighting status, for example, from alerting to illumination and/or that converts from power storage in a power storage member to power supply to the light emitting member. A lighting device can also be provided that can be efficiently used as a cordless lighting device. This is done by providing a power storage control member comprising a storage battery and a control circuit between the power receiving coil and the light source member of the light emitter. The power storage control member controls charging and discharging in such a manner that the light emitter can remain lit even when the light emitting member has been separated from the power supply coil on the power supply side and mutual induction has ceased to occur.

[0008][1]

More specifically, the invention comprises

① a lighting device comprising

a light emitter that has a light emitting member and a power receiving member that supplies power to the light emitting member and

a power source-side power supply member that supplies power to the light emitter,

that characteristically has a structure in which

a pair of mutual induction coils is provided, wherein one is incorporated in a connected manner in an electrical connection member at an end of the power receiving member of the light emitter and one is incorporated in a connected manner in an electrical connection member at an end of the power supply member, and

power is supplied from the power supply member to the power receiving member of the light emitter by electrical connection through mutual induction when the mutual induction coil (the power receiving coil) on the side of the power receiving member of the light emitter and the mutual induction coil (the power supply coil) on the side of the power supply member are positioned opposite one another in a prescribed position in a noncontacting state.

The invention further comprises

② a lighting device as described in ①, that characteristically has a structure in which

the light emitter comprises a light emitting member, a power receiving member, and a power storage control member comprising a storage battery and a control circuit that controls the current flow at the storage battery;

sensors that detect the presence of, respectively, the power supply coil and power receiving coil forming the pair, are incorporated in the light emitter and the power supply member; and

a magnet is disposed in the vicinity of the interior or the periphery of the power receiving coil and the power supply coil.

The invention further comprises

③ a lighting device as described in ②, characterized in that the light emitter is a portable emergency standby light that has a light-emitting alerting device and a flashlight-type lighting device.

---

1 Translator's Note. The section enumeration does in fact jump directly from [0004] to [0008] in the Japanese source document itself.

The invention further comprises

④ the lighting device described in ②, characterized in that the light emitter comprises a light-emitting alerting device and a flashlight-type lighting device both disposed in a fire extinguisher.

[0009]

Function

As shown in Figure 2, a light emitter and a power source-side power supply member **4** are formed separately: by placing these in a prescribed position during use, the power receiving coil **11** and the power supply coil **12** enter into a state of mutual induction and power is supplied between the power supply member **4** and the power receiving member **3**. Rather than connection as in the prior art by mechanical contact, connection between the light emitter **1** and the power source side has a configuration in which a mutual induction coil is divided into two coils and one is disposed in the light emitting member and one is disposed on the power source side. When these coils are disposed in proximity to one another across a prescribed gap, power can be supplied through mutual induction between the coil on the power source side and the coil on the light emitter side. A lighting device is therefore provided that enables insertion and removal without having mechanical contacts, that enables ON/OFF switching by changing the gap between the coils, and that eliminates concerns with regard to operation-induced spark generation and contact corrosion. In addition, the efficiency of power transfer to the lighting device is improved by disposing a magnet **13** at the periphery of the power receiving coil **11** and the power supply coil **12**; this also enables a reduction in size. The provision of a sensor, a power storage member, and a control circuit member in the light emitter enables power storage and power discharge to be carried out in an appropriate manner and enables efficient use without a connecting cord in a wide range of applications, such as detection of an emergency situation.

[0010]

Examples

Examples of the invention are described hereinbelow with reference to the drawings. Figure 1 contains a transverse cross section of an example of a lighting device according to the invention. Figure 2 contains a diagram that describes the principle of power supply in the lighting device according to the present invention. Figure 3 contains a transverse cross section of another example of a lighting device according to the invention. Figure 4 contains a

transverse cross section of an example in which the inventive lighting device is applied to a portable emergency standby light. Figure 5 contains a transverse cross section of an example in which the inventive lighting device is applied to an alerting and a flashlight-type lighting device in association with a fire extinguisher.

[0011]

Example 1

The lighting device as shown in Figure 1 comprises a light emitter **1** and a power source-side power supply member **4**; the light emitter **1** comprises a light emitting member **14** and a power receiving member **3**. The power source-side power supply member **4** is incorporated in an attachment frame **2** and is attached to a wall or ceiling. A ring-shaped power supply coil **12** is connected to an end of the power supply member **4** and is incorporated in an insulated state within the attachment frame **2**. The light emitter **1** comprises the light emitting member **14** and the power receiving member **3** formed into a single body. The light emitting member **14** is a filament-type electric light bulb, and a power receiving coil **11** is connected to an end of a lead that exits from the electric light bulb. The circumference of the power receiving coil **11** is protected by insulating material at the end of the power receiving member **3** and is sealed in a gastight condition. By bringing the power receiving member **3** of the light emitter **1** into proximity to the power supply member **4** and locking with a locking piece **28** that extends from the power supply member **4**, a configuration is achieved in which mutual induction proceeds at a good efficiency across a specified gap. The lighting device in this example uses a low-pressure incandescent light bulb as the light emitting member **14**, and the power supply coil **12** and power receiving coil **11** each have an outer diameter of 30 mm and an inner diameter of 15 mm. The entire exterior surface of each coil is coated with an insulating plastic to a thickness of approximately 0.4 mm, so that the coils can be brought to a proximity of approximately 1 mm when brought into proximity in a coaxial manner. The incandescent bulb could be lit when the power source applied a 100 kHz, 5V AC current to the power supply coil **12**. This lighting device, because it lacked exposed contacts, could be used without concern for problems such as electric shock and defective contact.

[0012]

Example 2

For a second example, shown in Figure 3, the lighting device of Example 1 is provided on the light emitter **1** side with a power storage control member **17** between the power receiving coil

11 and the light emitting member **14**; this power storage control member **17** has a storage battery and a control circuit. Associated with both the power receiving coil **11** and the power supply coil **12** is a structure in which a magnet **13** is disposed in contact with the outer side of the coil when the coil resides in the approximated configuration. The power receiving coil **11** and power supply coil **12** used in this example each had the same structure as in Example 1. The magnet **13** was a ferrite disk with a magnetic permeability of 10,000 at 100 kHz. An alkaline battery is used for the power storage member of the power storage control member **17**, while the control circuit member incorporates circuits for rectification and control of charging and discharge. The power storage control member **17** detects and compares the voltage from the power receiving coil **11** and the voltage from the battery and carries out charging when the voltage from the battery falls below a prescribed value and the voltage from the power receiving coil **11** is ≥ a prescribed value (power is also supplied to the bulb of the light emitting member **14** at the same time). When the light emitter **1** is moved from its prescribed position, the voltage from the power receiving coil **11** falls away to zero and the control circuit member exercises control in which the power receiving coil **11** is uncoupled and power is discharged to the light emitting member **14**. Illumination could be obtained when 100 kHz, 5V AC current was applied to the power supply coil **12**. The efficiency of power transfer to the light emitter for illumination from the power source side was approximately 60% in the lighting device of this example. Even when the light emitter **1** was removed from the locking piece **28** on the attachment frame **2** and carried about, it could still provide illumination just as when it was installed.

[0013]

Example 3

As shown in Figures 4 and 5, this Example 3 provides an example of a portable emergency standby light (Figure 4) and an example of a light-emitting alerting device **22** and a flashlight-type lighting device **24** on a fire extinguisher (Figure 5). The basic structure was the same as in Example 1, and the power receiving coil **11** and power supply coil **12** had the same dimensions. A disk-shaped magnet **13** is installed for each coil in a position in contact with the outer side of the coil when the coil has been brought into its approximated configuration. A ferrite disk with a magnetic permeability of 10,000 is used as the magnet **13** in this example. There are installed — in the light emitter (emergency lamp **21**, first extinguisher **26**) and the power source-side power supply member disposed in the platform **18** — sensors **15**, **16** capable of detecting whether the therewith associated power supply member and light emitter, respectively, are in their prescribed approximated positions, and in each case these are

connected to the power storage control member **17**. Under ordinary conditions, the presence of the light emitter member of the lighting device is confirmed by the sensors **15**, **16**, resulting in the supply of power to the power source-side power supply coil **12** and control of charging and discharging at the charging member; the light-emitting alerting device **22** is also lit at the same time. When the light emitter (portable emergency standby light **21** or first extinguisher **26**) is removed from the prescribed position, the flashlight-type lighting device **24** is lit by power from the power storage member on the light emitter side, while on the power source side the current flow to the power supply coil **12** is shut off and the fact that the light emitter (emergency light **21**, fire extinguisher **26**) has been moved can be communicated to the responsible staff.

[0014]

Advantageous Effects of the Invention

As described hereinabove, the invention has a structure that eliminates any necessity for exposure of the electrical contact members, and in consequence thereof provides a lighting device that eliminates concerns with regard to electrical shock and noise, that eliminates concerns with regard to degradation of the contacts by humidity and corrosive gases, that eliminates concerns with regard to use after a long period of standing, that can be used without concern at locations where there is a risk of exposure to flammable gases, and that can be used without a connecting cord.

Brief Description of the Drawings

Figure 1 contains a transverse cross section of an example of a lighting device according to the invention. Figure 2 contains a diagram that describes the principle of power supply in the lighting device according to the present invention. Figure 3 contains a transverse cross section of another example of a lighting device according to the invention. Figure 4 contains a transverse cross section of an example in which the inventive lighting device is applied to a portable emergency standby light. Figure 5 contains a transverse cross section of an example in which the inventive lighting device is applied to an alerting device and a flashlight-type lighting device in association with a fire extinguisher. Figure 6 contains a transverse cross section that describes the connection between the light emitter and the power source-side power supply member in a prior-art lighting device.

Reference Symbols

1 ..... light emitter
2 ..... attachment frame
3 ..... power receiving member
4 ..... power supply member
5 ..... power receiving terminal
6 ..... power supply terminal
7 ..... glass envelope
8 ..... filament
9 ..... power source line
10 ..... sealing member
11 ..... power receiving coil
12 ..... power supply coil
13 ..... magnet
14 ..... light emitting member
15 ..... sensor
16 ..... sensor
17 ..... power storage control member
18 ..... platform
19 ..... locking spring
20 ..... hand switch
21 ..... light-emitting alerting device
22 ..... light-emitting alerting device
23 ..... cable for a light-emitting alerting device
24 ..... flashlight-type lighting device
25 ..... cable for a flashlight-type lighting device
26 ..... fire extinguisher
27 ..... spray nozzle
28 ..... locking piece

Figure 1.

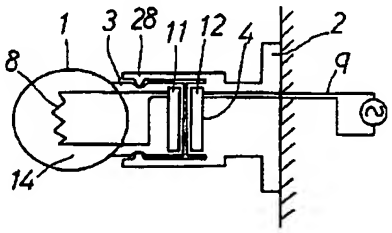


Figure 2.

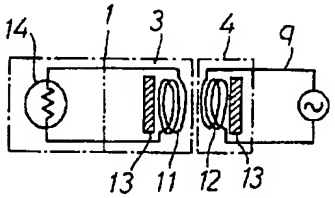


Figure 3.

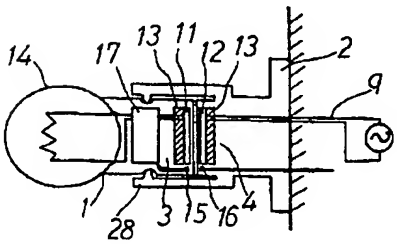


Figure 4.

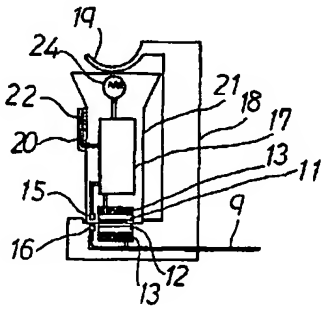


Figure 5.

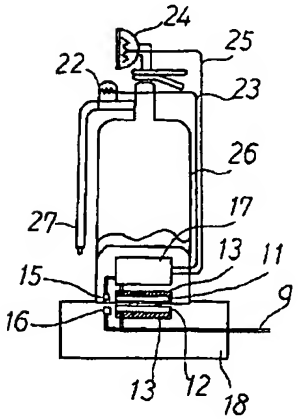


Figure 6.